I. General notes

Event data and object models for binary and multiple star systems need to be treated together, both for unresolved systems that generate a single event and for resolved systems that generate more than one.

The present version of the Data Flow Diagram shows both the old (A, B, C) designations for the astrometric processing stages and the new designations for the astrometric (I, IIa, ...VIa,) and photometric (I, IIp, IIIp) processing stages.

II. Definitions and notes

Batch: An ensemble of data that are to be processed together. The batch includes all data collected during the "batch interval."

Event: The shifting off the CCD of the pixels containing "light" from a single target.

Event Time: The interpolated epoch at which the centroid of a target shifted off the CCD.

Object: An astronomical entity that may contain more than one physical body.

Parameters: Both the values (or estimates) and the corresponding covariance, where appropriate.

Spiral: The path across the celestial sphere followed by the center of one of the observing fields. (Observing Spiral)

Target: An object that is designated for observation by FAME.

III. Notes for numbered lines

1. Uncalibrated data flows from pixel data archive when recalibrating.

2. Calibrated data flows from pixel data archive when applying new object models.

3. Data flows from event archive when adding fiducial stars.

4. An event comprises the epoch of star passage, the chip number, the lateral centroid, the star identification, and the object model, if used.

5. The fiducial star list is needed by event selection for stage "mini-C", not for stage C.

IV. Notes for particular blocks

A. Received astrometric data.

Data include well fill levels (photoelectron counts), time tags, chip number, and column number. Also included are spacecraft engineering data that can be used for calibration of astrometric data.

B. Fiducial star list.

The fiducial stars serve two functions. First, they provide stable celestial points to be repeatedly observed at high precision through both instrument ports. The resulting sets of repeated observations of each fiducial star provide the internal connections to form the required "rigid models" of the spacecraft rotation. Second, through the application of a mild *a priori* constraint on their positions, the fiducial stars provide approximately correct orientations for the observing spirals and the global fit, thus ensuring that the catalog will be built at close to the "correct" orientation.

C. Fit star positions "one at a time" [VI].

This stage of the processing has three functions. First, it does as advertised, and fits just star positions. Second, it examines the residuals for signs of hidden companions and investigates them. Third, it extracts CCD calibration parameters from a large set of sorted events, as discussed in the next paragraph.

The CCD's will have astrometric error (bias) that may vary across the chip. In the worst case imaginable, the error would be uncorrelated from column to column and not the same from one chip to the next. The need to determine these CCD parameters, each of which is measured by a large set of observations, would appear to require inverting a huge ($\sim 10^8 \times 10^8$) matrix involving astrometric parameters for all objects, plus the CCD parameters. However, the huge matrix is block diagonal, and partial prereduction can be applied. There are independent blocks for each CCD's parameters (at worst, 2048×2048), and for each star's astrometric parameters (at least 5×5 per star). Thus, the stars would be prereduced out, and the CCD blocks would then be inverted to determine the CCD parameters. In a subsequent operation, the star positions would be estimated.

V. Iteration

Redo "centroid fits" with an enhanced set of object models, i.e., an enhanced treatment of multiplicity and of star spectrum (which affects the width of the image *via* diffraction).

Redo stages A, B, and mini-C with a cleaned-up list of fiducial stars.

Redo stages A and B, and do (a full) C with refined positions for fiducial stars.

Redo calibration, centroid fit, and stages A, B, and C (or mini-C) with CCD calibration data from mission: photometric and astrometric.